INTRODUCTION

Flowers and leafy ornamentals have in India immense values in socio-cultural-religious aspects apart from having a good deal of commercial values both in domestic and export markets. India has 2,32,540 ha under flower cultivation with production of 4,59,156 tonnes of loose flowers and 1,15,613 cut flowers (Chadha, 2010 and Gupta, 2012). The huge garden in the Ashrama of the Narendrapur Ramakrishna Mission has a very rich collection of both flowers and leafy ornamentals and those are regularly infested with a large variety of insects and mites which have not so far been explored, studied and documented. In view of this, the present study was undertaken to explore the mites both phytophagous and predatory species infesting these plants, their importance as pests or beneficial predators, if any, and some information has also been provided as to their management mostly by herbal pesticides as application of synthetic chemical pesticides are environmentally unfriendly.

MATERIAL AND METHODS

The mites were collected mainly by hand picking method and also by separation of mite specimens from leaves through Tullgren funnels. Those were preserved in 70% ethyl alcohol and were studied after mounting in Hoyer’s medium. Most of those were identified by the second author (SKG) by examining the specimens under Olympus research microscope and consulting the updated literature.

RESULTS AND DISCUSSION

The identification of the collected mite specimens from 25 types of flowers and ornamental plants from the garden of the Ramakrishna Mission revealed the occurrence of 21 species under 14 genera belonging to 8 families and 2 orders as given in Table - 1 with their hosts, nature of association, status as pests/predators and period of occurrence. At the end, a paragraph has been devoted suggesting management of the pest species and profitable utilization of the predatory mites for biocontrol.

MANAGEMENT OF MITE PESTS

Chemical Method: For management of injurious tetranychid mites some of the chemical pesticides which have been found effective are: wettable sulphur (0.14%), difenthuron (0.1% @ 300 gm/ha), bromoprophylate (0.1%), monocrotophos (0.036%) + hippe (Madhuca latifolia oil 0.04%), dicofol (0.02%) + pongamia oil (0.04%), abamectin (1.9% EC @ 2 ml/l of water).
Table 1: List of mite species collected on floricultural and leafy ornamental plants at Ramakrishna Mission Ashrama, Narendrapur

<table>
<thead>
<tr>
<th>Family/Order/Species</th>
<th>Hosts/Habitats</th>
<th>Nature of association</th>
<th>Remarks (Nature of damage /Predatory importance, etc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ORDER I: PROSTIGMATA</strong></td>
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<tr>
<td><strong>Family 1: Tetranychidae</strong></td>
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<tr>
<td>1. <em>Tetranychus urticae</em> Koch</td>
<td>Rose (Rosa centifolia), Zinia (Zinia elegans), Marigold (Tagetes patula), Dahlia (Dahlia sp.), Sunflower (Helianthus annuus), Aparajita (Clitoria ternatea), Siuli (Nyctanthes arbor-tristis)</td>
<td>Phytophagous, occurs on undersurface of leaves in colony covered with thin webs.</td>
<td>It is a serious pest of rose, dahlia and aparajita. Infested leaves become yellow, later brown and finally fall off. Consequently the plant becomes unhealthy, affects flower production. This mite is available throughout the year on one or the other ornamental plant but its attack is more serious during May-June and relatively less during rainy season.</td>
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<tr>
<td>2. <em>Tetranychus biharensis</em> Hirst</td>
<td>Rose</td>
<td>-do-</td>
<td>Occasionally attacks, no serious damage is done. It occurs during May-June and none during rest of the year.</td>
</tr>
<tr>
<td>3. <em>Tetranychus macfarlanei</em> Prichard &amp; Baker</td>
<td>Chrysanthemum (Chrysanthemum coronaria), Champa (Magnolia champaca)</td>
<td>-do-</td>
<td>As above. This mite also occurs throughout the year but its population remains at high level during April-May and occasionally during October-November, absent during monsoon months.</td>
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<tr>
<td>4. <em>Tetranychus ludeni</em> Zacher</td>
<td>Marigold, Dahlia</td>
<td>-do-</td>
<td>As above</td>
</tr>
<tr>
<td>5. <em>Tetranychus neocaledonicus</em> Andre</td>
<td>Jasmine (Jasminum sambac), Rose</td>
<td>-do-</td>
<td>As above</td>
</tr>
<tr>
<td>6. <em>Eutetranychus orientalis</em> (Klein)</td>
<td>Sthal Padma (Hibiscus mutabilis), Rose, Oleander (Nerium indicum), Sunflower, Kolke (Thevetia peruviana)</td>
<td>Phytophagous, occurs on upper surface of leaves</td>
<td>Very serious pest especially of Sthal padma and Oleander, the infested leaves develop brownish patch, such leaves gradually dry up. This mite infests one or the other ornamental plant all through the year. However it assumes serious status during May-June and again during October-November. It is rarely seen during monsoon months when these are washed away because of its occurrence on upper leaf surface.</td>
</tr>
<tr>
<td><strong>Family 2: Tenuipalpidae</strong></td>
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<tr>
<td>7. <em>Brevipalpus californicus</em> (Banks)</td>
<td>Bougainvillea (Bougainvillea spectabilis), Tabernae montana coronaria, Jaba (Hibiscus rosa-sinensis), Sunflower</td>
<td>Phytophagous, occurs on undersurface along mid-ribs</td>
<td>Seriously attacks all these plants, infested leaves turn pale yellow, later dry. This is available all through the year but its population reaches to an alarming stage during April -July and again during October to early part of December.</td>
</tr>
<tr>
<td>8. <em>Brevipalpus phoenicis</em> (Geijskes)</td>
<td>Rose, Oleander, Zinia</td>
<td>As above</td>
<td>As above</td>
</tr>
<tr>
<td>9. <em>Brevipalpus obovatus</em> Donnadieu</td>
<td>Coleus, Canna (Canna indica), Croton</td>
<td>As above</td>
<td>As above</td>
</tr>
</tbody>
</table>

This is rather uncommon mite on ornamental plants, population always remains low hence causes no economic damage to the host plant.
### FAMILY 3: Tarsonemidae

10. *Polyphagotarsonemus latus* (Banks)  
   - **Host**: Marigold  
   - **Predation Type**: As above  
   - **Notes**: The attacked young apical leaves turn crinkled/curl. This mite occurs on ornamental plants especially during dry months and scares during monsoon months. During winter it occurs on young marigold leaves.

### FAMILY 4: Eriophyidae

11. *Aceria jasmini* Channa Basavanna  
   - **Host**: Jasmine  
   - **Predation Type**: Phytophagous, occurs on upper surface of leaves  
   - **Notes**: No apparent damage symptoms noticed. Population never attains any alarming state to inflict economic damage though in other parts of India it is quite a serious pest.

### FAMILY 5: Cunaxidae

12. *Dactyloscirus* sp.  
   - **Host**: Cosmos (*Cosmos sulphureus*)  
   - **Predation Type**: Predatory  
   - **Notes**: Very low population, no predatory importance noticed.

13. *Cunaxa caproolus* (Berlese)  
   - **Host**: Atashi (*Crotonaria sericea*)  
   - **Predation Type**: As above  
   - **Notes**: As above

### FAMILY 6: Stigmaeidae

14. *Agistemus terminalis* (Quayle)  
   - **Hosts**: Kadamba (*Neolamarckia cadamba*), Codaeum, Chhatim (*Alstonia scholaris*)  
   - **Predation Type**: As above  
   - **Notes**: This mite was found in field associated with *Brevipalpus* mite. However feeding was not observed.

15. *Agistemus* sp. n. *Agistemus* sp.  
   - **Host**: Akanda (*Calotropis procera*)  
   - **Predation Type**: As above  
   - **Notes**: As above

### FAMILY 7: Tydeidae

16. *Pranematus fleschneri* Baker  
   - **Host**: Gandharaj  
   - **Predation Type**: As above  
   - **Notes**: As above

### ORDER II: MESOSTIGMATA

### FAMILY 8: Phytoseiidae

17. *Neoseiulus longispinosus* (Evans)  
   - **Hosts**: Rose, Siuli, Aparajita  
   - **Predation Type**: As above  
   - **Notes**: Very efficient predator of *Tetranychus urticae* on rose, aparajita, found feeding in the field the immature stages of this mite, consequently the body colour turned red.

18. *Ablyseius largoensis* (Muma)  
   - **Hosts**: Rose, Bougainvillea, Kamini (*Murraya exotica*)  
   - **Predation Type**: As above  
   - **Notes**: Very effective predator of *Brevipalpus* sp. on Tagar. It is more common on fruit trees than on ornamental plants where it feeds on adults and immatures of *Tetranychus* sp.

19. *Euseius coccineae* Gupta  
   - **Host**: Tagar, Marigold  
   - **Predation Type**: Good predator of *E. urticae* on marigold

20. *Typhlodromips sukhovensis* Gupta  
   - **Host**: Kolk  
   - **Predation Type**: Good predator of *Eutetranychus orientalis*

21. *Paraphytoseius multicentrotus* (Swirski & Shechter)  
   - **Hosts**: Sunflower, Siuli  
   - **Predation Type**: As above  
   - **Notes**: Good predator of *Brevipalpus californicus* on sunflower. This species is quite common on several fruit trees as well as on weeds.
Some botanical pesticides like leaf extracts of karanja, neem, nishinda and tulsi, rhizome extracts of turmeric and garlic may also be used at 3-5% levels. In addition some commercially available botanical pesticides like Replin, Aza - 3000, Econem plus are also useful if used at early stage of infestation.

**Cultural Method** : Using of resistant varieties and adopting barrier crop, intercropping, etc. will also be effective in management of mite pests.

**Biological Method** : Using and conserving biological agents like Coccinellid beetles, Chrysopids and predatory mites belonging to Phytoseiidae will also be effective.

It is also to be borne in mind that indiscriminate spraying of synthetic chemical pesticides especially at their sublethal doses should be avoided as it leads to pest resistance and resurgence. Therefore, attempts to be made to take up spraying programme at early stage of pest infestation and conserve the natural enemies mentioned earlier which can keep the pest mite population below EIL.

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**REFERENCES**
